the labours of Ingen-Housz, and found that his real worth had not been recognised. Much information was gathered that showed how many-sided his activities had been in science and in medicine, and Prof. Wiesner was induced by the meeting of the International Botanical Congress at Vienna to present the results of his labour of love in this volume. It must rank as a classic, admirable as a biography of a leader in research and as a history of scientific progress in a most important field of study.

Jan Ingen-Housz was born at Breda, in Brabant, South Holland, on December 8, 1730, and attended the higher school there until the age of sixteen, after which he continued his education in the Universities of Louvain, Leyden, Paris, and Edinburgh, even after he had graduated (at the age of twenty-two) in Louvain. From 1757 to 1765 he practised medicine in Breda, but, after the death of his father, he went to London, on the invitation of Sir John Pringle, the King's physician. Here he became acquainted with distinguished anatomists and medical men, and made a study of the method of inoculation for small-pox. From London he went to Vienna, by the wish of the Empress Maria Theresa, and introduced the use of inoculation there.

He frequently visited Switzerland, France, Holland, and England. For the last country he had an especial affection, regarding it as the land in which science was most honoured and furthered. He died in 1799, near London, while on a visit to the Marquis of Lansdowne.

Ingen-Housz approached the research which has brought him most fame—the relation of plants to the atmosphere—from the standpoints of the physicist and chemist rather than the botanist, and with a view to the value of green plants exposed to daylight as purifiers of the atmosphere from the products of animal respiration. He had busied himself with the physical problems of electricity, magnetism, optics, and heat, and had made useful contributions to their investigation. His researches in chemistry led to improvements in the preparation of matches and in other matters of practical value.

A very valuable advance in microscopical technique introduced by him was the use of a cover over the drops of water or other fluids in which the objects were included for examination. At first the covers were made of mica, but soon he employed thin glass covers, as is now the custom.

His researches into the nutrition of plants were for the most part carried on during his stay in Vienna, although his first work on the subject was published in London in 1779 under the title "Experiments upon Vegetables, discovering their great Power of Purifying the Common Air in the Sunshine, and of Injuring in the Shade and at Night." It was soon issued in German and Dutch translations.

When Ingen-Housz began the researches that led him to such great results it was generally taught that plants extracted from the soil the materials of which they were in want in the conditions in which they exist in the plant, and that nothing of importance required to, or did, pass off from plants. That gas was given off had been determined by Priestley and by Scheele, who had investigated the relations of green plants with the atmosphere; but Priestley arrived at the conclusion that these plants always freed the atmosphere from the "fixed air" (carbon dioxide) emitted by animals and emitted "dephlogisticated air" (oxygen), and Scheele believed that they always added to the amount of the "fixed air."

Ingen-Housz succeeded in showing that both these eminent chemists were right in part, the green parts in daylight emitting "dephlogisticated air," while parts not green at all times, and even green parts in darkness, like animals, emitted "fixed air." His views were combated, even Priestley joining in attacking them, and by his authority preventing their importance from being recognised as it deserved to be.

The new foundation for chemical investigation afforded by Lavoisier's discoveries was made use of by Ingen-Housz to explain more fully the nutrition of green plants than had been possible until the recognition of the composition of the "dephlogisticated air" and the "fixed air," and he showed that the carbon contained in plants is derived from the carbon dioxide of the atmosphere instead of from the soil as had been supposed by Senebier. He also showed that the carbon could be acquired by green plants only in light, and that carbon dioxide beyond a limited degree of concentration in the atmosphere proved harmful even to plants as well as to animals. He thus distinguished between the respiration and the assimilation in plants, a distinction not fully realised or taught by botanists until many years later. The value of humus and of vegetable manure as food for plants he ascribed, not to the substance being directly employed by the plants as food, but to its effect on the mineral contents of the soil, which were rendered more easy of absorption, and he demonstrated that diluted mineral acids produced similar beneficial effects. His later views on the nutrition of plants are given in "An Essay on the Food of Plants and the Renovation of Soils," which is contained in a collection of essays (in which it is No. 3) issued under the title "Additional Appendix to the Outlines of the Fifteenth Chapter of the Proposed General Report from the Board of Agriculture on the Subjects of Manures," London, 1796.

An appendix stating the sources of information about Ingen-Housz, with extracts from letters and a bibliography of his writings, adds to the value of the volume, and supports Prof. Wiesner's claim that he must be classed among the founders of botany, and that he showed singular ability also as an investigator in physics and in medicine.

ANALYSIS OF PAINTS.

The Chemistry of Paints and Paint Vehicles. By Clare H. Hall. Pp. vi+134. (London: Constable and Co., Ltd., 1906.) Price 8*s.* net.

THIS book or booklet is not intended to appeal to the artist, the house-painter, or the manufacturer, but to the young analyst who has had little or no experimental acquaintance with the materials discussed in its pages. The scope of the volume is indeed extremely limited, since it deals with the ex-

amination of only a few common pigments, and by no means exhaustively even with these; about some vehicles and diluents the information to be found in these pages is less meagre.

There are five chapters in this book, an appendix containing thirteen tables, and an adequate index. Chapter i. is devoted to the determination of certain constituents of common paints, and deals with aluminium, barium, carbon dioxide, chromium, iron, lead, magnesium, manganese, silicon, sulphur, and zinc. In this chapter, which occupies only fourteen pages, we are struck with the inadequate, and even puerile, drawing of the CO_2 apparatus shown in the figure on p. 3, and with the confused nomenclature of the two oxides of chromium. For example, on pp. 4 and 5 we are told that "all chromate compounds must be changed into the chromic state which is indicated by an intense green color," and that this "green color is due to chromic salts." The omission of any caution as to the non-volatile impurities commonly occurring in the hydrofluoric solution used in ascertaining the purity of silica is unfortunate.

The properties of a few common pigments, such as Prussian blue, ultramarine, ivory-black, umber, Vandyke brown, the mixture of lead chromate and Prussian blue wrongly called chrome green, iron-red, genuine and imitative vermilion, a number of white pigments or adulterants, chrome yellow, red lead, yellow ochre, and the siennas are dealt with. This list serves to show how many of the finer and choicer pigments, namely, aureolin, cadmium yellow, viridian, and cobalt-blue, are excluded from consideration. Nor can we agree with everything we find in these pages. Ivory- and bone-black are not "*combinations* of carbon, hydrocarbons, water and mineral matter." Graphite does not possess a "*brownish* gray" colour; and there are many words wrongly spelt in this chapter, such as analine for aniline, and limionite for limonite.

The examination of actual paints, and of such as are mixed ready for use, is dealt with in the third chapter. The preliminary treatment of oil-paints necessary before they can be tested or analysed is duly described. Chapter iv. is concerned with the matching of samples, while the final chapter is devoted to vehicles. Here will be found a more adequate, detailed treatment of the subject. On pp. 89–92, for instance, the curious drying oil called Chinese wood oil is described. This oil is used largely both in China and Japan, and is imported into America and Europe in increasing quantities. It is obtained from the seeds of *Aleurites Fordii* (Hemsley) and of other species of the same genus, as *A. cordata* and *A. trisperma*. Mr. C. H. Hall states (*loc. cit.*) that this oil, if heated to 285° C. to 300° C., suddenly solidifies into a jelly which is no longer soluble in the usual solvents, and cannot be reduced again to the liquid state. Mr. Hall's statement that Chinese wood oil, even in small proportion, confers upon paints the property of drying without gloss, and may be used as a substitute for wax in painting media intended to produce a dull or matt surface, seems to merit particular attention.

The thirteen tables of constants, coefficients, and specific gravities which constitute the appendix to this volume will be found useful by the analyst. There is a full index.

This little book, with all its imperfections and its immaturity, is not destitute of merit.

OUR BOOK SHELF.

British Rainfall, 1905. (Forty-fifth annual volume.) By Dr. Hugh Robert Mill. Pp. 271. (London: Edward Stanford, 1906.) Price 10*s*.

THE forty-fifth issue of this annual volume tells us better than any mere description could do of the healthy and active state of this voluntary rainfall organisation. When it is considered that more than 4000 individuals scattered over the British Isles read their rain-gauges at 9 o'clock every morning, enter their results on a form, and send in monthly returns to the central bureau at 62 Camden Square, and do all this voluntarily, it is impossible not to admire this band of enthusiasts for their united efforts in so good a cause.

The valuable collection of rainfall statistics is not, however, allowed to lie idle, for the energetic head of this organisation, Dr. H. R. Mill, with his small staff, brings all the facts together, and discusses the distribution of this rainfall both in space and time.

The present volume shows how well this work is carried out, and the observers must feel a great amount of satisfaction in seeing their united efforts so ably handled. Fronting p. 64 is a map indicating the positions of the 4096 rain-gauges at present in use, and one can see at a glance the districts where observers are urgently needed. Ireland and north and central Scotland are conspicuously in need of more volunteers, and it is hoped that many of the places mentioned in the text will soon be counted among the recording stations.

As meteorological readers of NATURE are fully acquainted with the general arrangement of the matter in these annual volumes, it is only necessary in this notice to direct attention to some of the discussions on the collected statistics. Thus, after a brief review of the recent important publication on the "Precipitation in the North German River Basins," compiled by Prof. Hellmann, we are presented with some valuable data on the relation of evaporation from a water surface to other meteorological phenomena. The section on heavy falls on rainfall days in 1905 will be found very interesting reading, and the numerous maps show at a glance the distribution of these falls over the country. After sections dealing with the distribution of rainfall in time, and a discussion of monthly rainfall, we come to the relation of the total fall of rain in 1905 to the average. To sum up in a few words the result of this discussion, it may be said that for the whole of England and Wales the general rainfall for 1905 was 16 per cent. below the average. In fact, so low was this figure that "except for 1902 and 1893 there has not been so dry a year in England since the memorable drought of 1887." It will be interesting to see how the present year's rainfall statistics compare with those of 1905. In 1905 Scotland as a whole had a deficiency of 5 per cent., while Ireland suffered to the extent of 12 per cent.

In addition to a great number of tables, the text is well supplied with numerous suitable maps and illustrations, making the volume a valuable summary of British rainfall for the past year.

W. J. S. L.